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Nutritional Status, Health Status, and Work Productivity of Cocoa Farmers in Polewali Mandar, Indonesia

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ABSTRACT

The objective of this study was to analyze the associations between nutritional status, health status, other determining factors with work productivity of cocoa farmers. This cross-sectional study involved 58 male cocoa farmers aged 18–65 years old in two districts of Polewali Mandar. Data on food consumption and habit as well as health status were collected via structured interviews. While, blood pressure and anthropometric parameters were measured using standard equipment of blood pressure meter, weight scale, and height scale. Spearman's test and Principal Components Regression (PCR) analysis were implemented to explore factors associated with farmers' work productivity. There was no relationship between Body Mass Index (BMI) and work productivity. However, there was a significant positive association between central obesity with days of absent (r=0.275; p=0.037). We also found negative association between blood pressure and the amount of cocoa picked daily (r=-0.366; p=0.005). PCR statistical analysis results showed that the amount of cocoa picked per day were significantly associated with smaller waist circumference, coffee consumption, and good exercise habit. While, decrease in consumption of fruits and vegetables was significantly associated with the number of absence days due to health problems. Thus, it can be concluded that work productivity of male cocoa farmers was associated with food consumption, physical activity, and lifestyle factors.

Keywords: cocoa farmer, health status, nutritional status, productivity

INTRODUCTION

The agricultural sector absorbs the largest labor force in Indonesia, however, the sector only contributed 10.60% of the total GDP (BPS 2017). This indicates low productivity in the agricultural sector. Cocoa is one of the leading commodities in the plantation sub sector. It contributes consistently as a source of foreign exchange revenue (Arsyad *et al.* 2011), the third largest after palm oil and rubber (Hasibuan *et al.* 2012). West Sulawesi is one of the centers of cocoa production in Indonesia since the 1980s.

Previous study showed that nutritional status and health status influenced work productivity (Bustillos *et al.* 2015; Businge *et al.* 2014). Work productivity was dependent upon many factors, aside from the two aforementioned, including weather, technology, work motivation, and more. Some studies have also explored the relationship between the size of health risk and the percentage of time impaired at work (presenteeism) (Boles *et al.* 2014). Brumby *et al.* (2012) showed that there was a high prevalence of risk factors for coronary heart disease and psychological stress in the farming communities in Australia. This combination of physical and mental health factors had a direct influence on the increase of abdominal obesity and co-morbidity of coronary heart disease in the study population, which later would have an impact on labor productivity. Another study conducted by Nwaiwu *et al.* (2017) on farmers in Ahiauzu Imo, Nigeria, showed that 18.33% of the subjects suffered high blood pressure (hypertension). Conditions of diseases such as hypertension are related to food consumption, lifestyle, and lack of physical activity. Poor health status will negatively affect farmers' productivity.

Based these findings on associations of nutritional status and health status with farmers' work productivity, this study aimed to explore

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the associations of these factors with the work productivity of cocoa farmers in Polewali Mandar, West Sulawesi, Indonesia. The result will offer insight on strategy to improve the farmer's productivity.

METHODS

Design, location, and time

This study is a cross-sectional study conducted at cocoa plantations in 2 sub-districts (Anreapi District and Mapilli District) in Polewali Mandar Regency, West Sulawesi Province, Indonesia. It was conducted in July–August 2017 as a part of the study entitled "Sustainability and Provitability of Cocoa-based Farming Systems in Indonesia" in a collaboration between the AIC (Australian-Indonesian Center) and InterCafe LPPM of IPB University, Hasanuddin University, and Syndey University of Australia. Ethical approval was granted by the Ethics Committee of the IPB University (4758/IT3.26.1/KEPMSM/PL/2017).

Sampling

The subjects were male cocoa farmers in 2 sub-districts of Polewali Mandar. The inclusion criteria of the subjects were 1) male aged 18–65 years; 2) cocoa farmers; and 3) willing and staying in the study sites during the study for interviews and direct anthropometric, body composition, and blood pressure measurements. The minimum sample size was calculated using the formula from Sujarweni (2012) and resulted in a minimal sample size of 45 male cocoa farmers, and we recruited 58 male cocoa farmers who satisfied the inclusion criteria.

Data collection

Primary data collected were the subjects' characteristics and measures of body mass index (weight and height), waist circumference, waist hip ratio, blood pressure, food consumption (2x24 hours food recall), eating habits and lifestyle, physical activity (2x24 hours activity recall), family health history, and work productivity data. Work productivity data in this study were obtained in two ways: measuring the amount of cocoa picked per day (in kilograms) and counting the number of absence days at the plantations in the last 1 month for illness/health reasons. Data regarding food consumption, lifestyle, physical activity, family health history, and work productivity were collected by interviewing farmers directly using structured questionnaires by trained enumerators. Body mass index, waist circumference, waist hip ratio, body composition, and blood pressure were measured with standard weight scale, height scale, tape measure, blood pressure meter, and body composition monitor (Omron HBF-375 Karada Scan).

Data analysis

The analysis used in this study involved descriptive analysis, Spearman's test to analyze the relationship of nutritional status and health status to work productivity, and Principal Component Regression (PCR) for analyzing the factors associated with work productivity.

RESULTS AND DISCUSSION

Characteristics of the subjects

Table 1 shows that most farmers (74.1%) were 40–65 years old, with a mean age of 45.05 years. Risk of non-communicable diseases and other chronic diseases increases in above 40 years old. Therefore, farmers over the age of 40 years were expected be more aware of their health by maintaining a healthy diet, exercise, and starting to avoid risky lifestyle such as smoking, consuming excessive alcohol and coffee, and limiting consumption of foods high in sugar, salt, and fat. Most of the subjects (53.4%) had a medium family size (4–5 persons per family) and had an elementary school level education (53.4%).

Almost 40% of all subjects had normal nutritional status. Research by Susanto *et al.* (2017) pointed out the variations in nutrition and health problems that occurred in farmers in Jember, namely, underweight (28.5%), overweight (10.6%), and anemia (62.6%). In addition, most of the cocoa farmers in the study had normal abdominal circumference (89.7%), and 10.3% of the subjects had central-obesity with abdominal circumferences greater than the threshold of 90 centimeters for men. Most of the subjects (58.6%) also had Waist Hip Ratio (WHR) in the normal category, while the rest (41.4%) had WHR in the at-risk category. The higher the waist circumference and WHR, the higher the risk of Non-Communicable Diseases (NCDs) and chronic non communicable diseases

such as cancer, cardiovascular disease, diabetes, hypertension, and others.

The blood pressure measurement showed that 46.5% of the subjects were categorized as pre-hypertensive, 34.5% had hypertension, and 19% had normal blood pressure. The study conducted by Nwaiwu *et al.* (2017) on farmers in Ahiauzu Imo, Nigeria, showed that 18.33% of the subjects suffered high blood pressure (hypertension). Regarding to risk of chronic non communicable diseases, previous research by Nurjanah (2015) in Citeureup showed that the dominant markers of metabolic syndrome among male workers were central obesity (96.6%), followed by hypertriglyceridemia (82.8%), low HDL cholesterol (72.4%), high GDP (62.1%), and high blood pressure (55.2%).

Table 1. Characteristics of the subjects

Characteristics of the subjects	n	%
Age		
18–40 years	11	25.9%
40–65 years	43	74.1%
Mean±SD	45.05±9.79 years	
Family size (persons)		
Small (≤4)	21	36.2%
Medium (5–6)	31	53.4%
Large (>7)	6	10.3%
Mean±SD	4.93±1.34 persons	
Educational level		
Elementary school	31	53.4%
Junior High School	10	17.2%
Senior High School	13	22.4%
College	1	1.7%
Not attending school	3	5.2%
Body mass index		
Underweight	6	10.3%
Normal	23	39.7%
Overweight	15	25.9%
Obesity	14	24.1%
Mean±SD	22.77±3.18	
Waist circumference		
Central obesity	6	10.3%
Normal	52	89.7%
Mean±SD	78.15±9.51 cm	
Waist to hip ratio (WHR)		
At risk	24	41.4%
Normal	34	58.6%
Mean±SD	0.88±0.05 cm	
Blood pressure		
Hypertension	20	34.5%
Pre-hypertension	27	46.5%
Normal	11	19.0%

Studies have shown that high blood pressure is associated with risky lifestyles, such as smoking, coffee consumption, lack of exercise, and high consumption of sodium. Thus, increasing physical activity, increasing consumption of fruits and vegetables, and reducing risky lifestyles and habits such as smoking, consuming alcohol, and excessive coffee consumption can prevent central obesity and hypertension.

Work productivity

Productivity is an average measure of the efficiency of production. Workers are considered productive if they are capable of producing outputs or products that are larger than those produced by other workers for the same time unit (Yadav & Marwah 2015). Work productivity in this study was measured in two ways: measuring the amount of cocoa picked per day (in kilograms) and counting the number of absence days to the plantations in the last 1 month due to illness/health reasons. Data in Table 2 show the work productivity of cocoa farmers in Polewali Mandar.

Table 2 shows that the mean weight of cocoa picked per day amounted to 26.69 kilograms. The minimum weight on a day was 4.2 kilograms, and the maximum was 75 kilograms. Most of the subjects (58.6%) never skipped any day of work at the plantation for reasons related to illness in the past 1 month (0 day). The average number of absence days in the last 1 month for illness/health reasons was only 1.33 days.

Relationship of nutritional status, health status, work productivity and other factors work productivity of cocoa farmers

The statistical analysis indicated that there was no relationship between nutritional status and work productivity of cocoa farmers. These results were in line with the research of Mahardikawati (2008), which showed that there was no relationship between nutritional status,

Table 2. Work productivity of cocoa farmers

Work productivity		
Amount of cocoa picked/day (kg)	n	%
1–25 kg	36	62.1
26–50 kg	17	29.3
51–75 kg	1	1.7
76–100 kg	4	6.9
Mean±SD	26.69±3.21	
Number of days absent for health reasons (days)	n	%
0 days	34	58.6
1–3 days	20	34.5
More than 3 days	4	6.9
Mean±SD	1.33±0.51	

reflected by the Body Mass Index (BMI), and level of work productivity. This was presumably because level of work productivity was influenced more by the consumption of nutrients, especially iron. Hence, BMI was not related directly to work productivity. In addition, both absenteeism and presenteeism were associated with obesity. However, our finding highlighted that being overweight based on BMI was weakly associated with work productivity. However, previous study by Bustillos *et al.* (2015) found otherwise, that obesity (BMI>30) was an independent risk factor for reduced work productivity.

Table 3 shows the relationships of nutritional status and health status to work productivity. Regarding health status, there was a significant relationship between health status as reflected by blood pressure and the amount of cocoa picked per day (in kilograms). The results of this study indicated that individuals who had higher blood pressure (suffering from pre-hypertension or hypertension) had lower work productivity based on the amount of cocoa picked per day (in kilograms). Some mild symptoms of high blood pressure might cause weaker physical strength than those with normal blood pressure as found by Businge *et al.* (2014). Another study conducted by Nwaiwu *et al.* (2017) on farmers in Ahiauzu Imo, Nigeria, showed that 18.33% of the subjects suffered from high blood pressure (hypertension). Hence, poor health status was also found to negatively affect the farmers' productivity. Individuals with high blood pressure had a greater potential to engage in absenteeism for health reasons, which would then affect work productivity.

In addition, we found that farmers who suffered from central obesity had a higher number of absence days than those who did not. It was because individuals who suffered central obesity had the potential to have a bigger risk of disease, affecting to number of absence days. Results of this study were in line with previous research by Robroek *et al.* (2010) on 10,624 workers in 49 Dutch companies in 2005–2009, which stated that obese workers had higher numbers of days for sick leave compared to normal-weight workers (OR=1.27; 95% CI:1.11–1.46). Another study from Pronk NP *et al.* (2004) on 683 workers showed that work performance was related to obesity. The study found several reasons for this association. First, obesity is significantly associated with interpersonal relationships. Individuals with obesity were reported to have a higher difficulty to work together with a work partner. Second, obesity was more significantly correlated with a higher number of work-loss days compared to normal weight.

In this study, work productivity was defined by two indicators, namely, the amount of cocoa picked per day and the number of absence days related to health problems. Table 4 summarizes some factors that influenced work productivity (amount of cocoa picked per day), namely, waist circumference, exercise habit, and coffee consumption. Further, based on our analysis, the number of absence days related to health problems was influenced by consumption of fruits and vegetables.

Table 4 shows the results of the analysis PCR (Principal Analysis Regression) of factors that influenced work productivity (amount of cocoa picked per day and number of absence days). The

Table 3. Relationships of nutritional status and health status to work productivity of cocoa farmers.

Variables	Work productivity			
	Cocoa picked per day		Number of absence days	
	r	p	r	p
Body mass index	0.087	0.516	-0.230	0.083
Central obesity	0.114	0.392	0.275	0.037[a]
Blood pressure	-0.366	0.005[a]	-0.085	0.525

[a] Spearman's test significant at $p<0.05$

Table 4. Factors influencing work productivity

Variables	Value	p
Amount of cocoa picked per day		
Waist circumference	-0.33	0.02[a]
Exercise habit	12.20	0.01[a]
Coffee consumption	16.35	0.01[a]
Number of absence days		
Consumption enough fruits and vegetables	-1.92	0.03[a]

[a] Significant at p<0.05

factors are waist circumference, exercise habits coffee consumption and consumption of fruits and vegetables. Waist circumference variable has a significant effect on work productivity. Increase by 1 cm in waist circumference will decrease productivity by 0.33 kilograms. Then, exercise variable has a significant effect on work productivity. Farmers who exercise have a greater weight of 12.20 kg in cocoa picked per day than people who don't exercise. The same for coffee consumption, where farmers who consume coffee picked 16.35 kgs more of cocoa daily than those who don't consume coffee. While, people who consume fruits and vegetables has less days of absence as much as 1.92 days compared to those who do not consume enough fruits and vegetables.

Study by Sjøgaard *et al.* (2016) on workers in Denmark showed that there was an 8% increase in productivity among workers after 3 months of exercise intervention. Sickness and absenteeism, in relation to improved or maintained productivity and work ability, were reduced. A regular exercise routine could make the farmers happier and more energetic, affecting their productivity. Then, regarding coffee consumption, a study by the EFSA Panel on Dietetic Products, Nutrition and Allergies (2011) showed that caffeine may also help to improve motor and physical performance. Caffeine improves motor performance, helping increase the speed of physical movement. With frequent consumption, tolerance develops the effects of caffeine, but the degree of tolerance varies, with near complete tolerance to caffeine's alerting effect and little or no tolerance to its effect on physical performance

Related to the intake of fruits and vegetables, the results of this study were in line with the research by Robroek *et al.* (2010) on 10,624 workers in 49 Dutch companies in 2005–2009, which showed a loss of productivity, with work being related to inadequate intake of vegetables and fruits and the presence of disease at a young age. The individuals who consumed fruits and vegetables would have better immune response and better health conditions compared with those who did not. It could reduce the number of health-related absence days in individuals who consumed fruits and vegetables and affect their work productivity (Robroek *et al.* 2010).

However, this study did have some limitations. This study was a cross-sectional study with a limited number of participants and only involved male farmers. Hence, it could not determine cause and effect, but it could identify potential associations and could not represent larger population. Thus, larger longitudinal data are needed to provide a better assessment of the cause and effect relationships between nutritional status, health status, and work productivity in cocoa farmers.

CONCLUSION

This study showed that intake of fruits and vegetables, coffee consumption, physical activity were positively associated with work productivity among male cocoa farmers. While hypertension and central obesity showed negative associations. Therefore, nutrition and health interventions such as food consumption and healthy lifestyle education are needed to improve the cocoa farmers work productivity both in term of sick leave and the amount of cocoa picked per day.

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AUTHOR DISCLOSURES

The authors have no conflict of interest.

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